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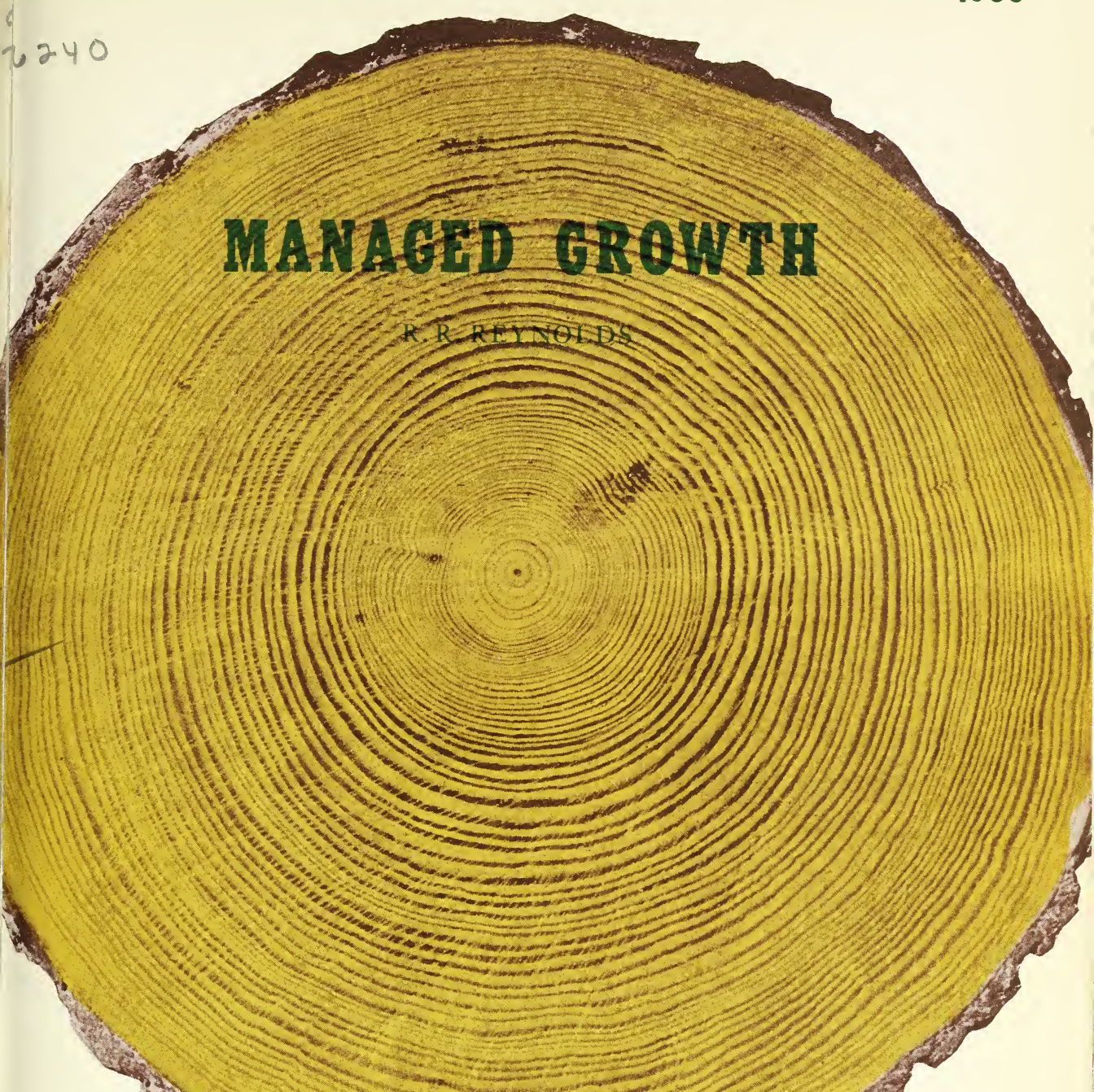

MANAGED GROWTH

R. R. REYNOLDS

SOUTHERN FOREST EXPERIMENT STATION

Philip A. Briegleb, Director

Forest Service, U. S. Department of Agriculture

The Nation has now awakened to the fact that timber for future needs must be grown from year to year as a crop from the soil.

--Timber Resource Review, 1955.

MANAGED GROWTH

R. R. Reynolds
Southern Forest Experiment Station

What are the growth possibilities in variably stocked loblolly-shortleaf pine stands containing an abundance of low-grade hardwoods? Can these possibilities be realized in a reasonable time? Can income exceed management expenses during the developmental period? What will be the costs and returns from management?

This paper answers these questions in terms of the first fifteen years of selection management on a 958-acre tract of loblolly-shortleaf pine-hardwoods on the Crossett Experimental Forest, near Crossett, Arkansas. 1/

Getting Started

The tract in 1937. --When management began in 1937 the tract was typical of medium to large woodlands in southern Arkansas and northern Louisiana. About 5 percent of the area had once been farmed and this portion supported even-aged pine stands from 10 to 60 years old. The remainder of the tract contained pines that had been too small to cut when the virgin timber was harvested in 1915. These hold-overs were intermingled with stems that had seeded in after 1915 and escaped the frequent fires that swept over the area until 1934, when effective fire protection began. Since only a few of the best white and red oaks had been cut in 1915, hardwoods of all sizes and species were plentiful. The average stand contained nearly as many hardwoods as pine (fig. 1). The hardwoods were chiefly oaks and gums.

In 1937 the tract was divided into 24 forty-acre compartments and a 100-percent inventory (by 1-inch diameter classes) was made of all trees larger than 3.5 inches in diameter. Three species groups

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1/ The Crossett Experimental Forest is maintained by the Southern Forest Experiment Station in cooperation with The Crossett Company.

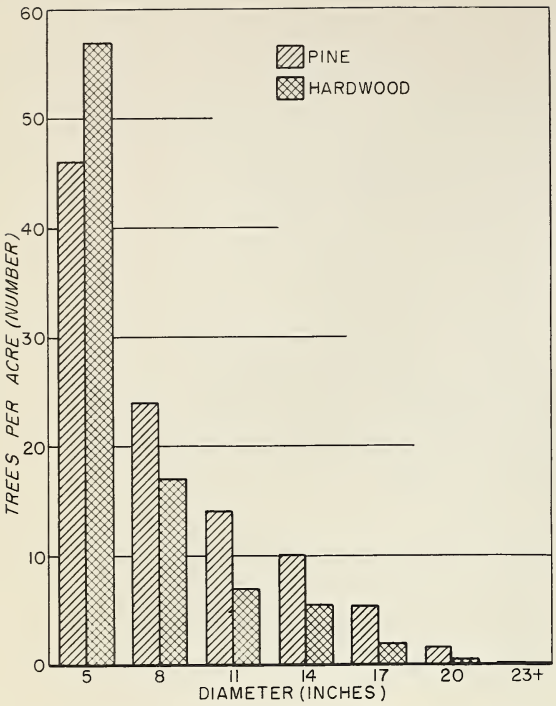

Figure 1.--Number of trees per acre in 1937, by 3-inch diameter groups.

were recognized: shortleaf and loblolly pines (Pinus echinata Mill., P. taeda L.), southern red and white oaks (Quercus falcata Michx., Q. alba L.), and other hardwoods.

Pine stocking varied considerably from forty to forty. The poorest compartment contained about 1,900 board feet (International 1/4-inch rule) per acre of sawtimber in pines larger than 11.5 inches d. b. h. The best had about 8,000 board feet. Most of the compartments varied between 2,000 and 5,000 board feet of pine. The average for the entire tract was 4,670 board feet of pine or 48 square feet of basal area. Hardwoods of marketable quality averaged 625 board feet per acre.

From the outset, timber quality was considered as important as volume. Accordingly, the grade of each log in pines over 9.5 inches was estimated at the time of the original and all subsequent inventories (for log grades, see page 14).

To avoid obscuring stand growth with variations in utilization practice over the years, logs have been uniformly estimated to a merchantable top of 7.5 inches. Further, local cubic-foot, board-foot, and topwood volume tables (pp. 15-16) have been consistently applied. It follows, then, that the stand changes reported here are due to growth and management practices, not to changes in volume tables.

The cutting cycles.--The study was designed to test, among other things, the results of managing compartments on 3-, 6-, and 9-year cutting cycles. The wide variation in stand structure, composition, and volume per acre required an equitable distribution of compartments to the various cycles. To achieve this end, all forties were ranked in order of their cubic volume of pine (per acre) in trees more than 3.5 inches d. b. h. Next, they were grouped into clusters of three, still in order of rank. Finally, the compartments within each cluster were assigned at

random to the cycles. Thus the compartments representing each cycle started with approximately the same variation in pine growing stock. Figure 2 indicates the assignment of compartments.

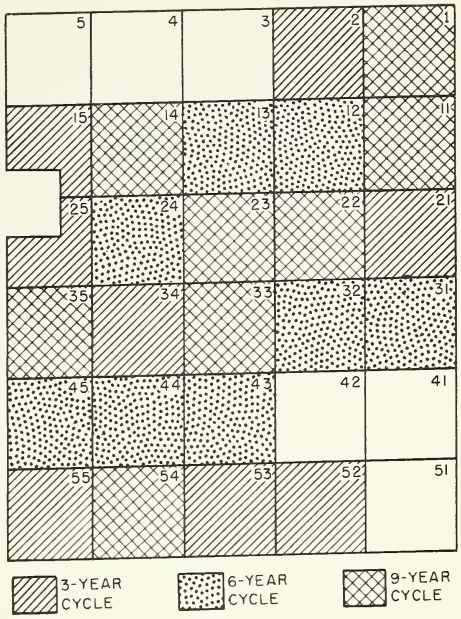

Figure 2.--Assignment of compartments.

Although the data are here reported by cutting cycle, it is much too soon to draw conclusions from this feature of the study.

Reinventories.--The 1937 inventory provided the basis for setting up the records and initiating the study. At the end of the designated cutting cycle, 100-percent inventories are made on each compartment. These reinventories establish the net growth over the cycle and provide for determining the allowable cut. To assure that the growth calculations are based on trees actually left, records are kept of unmarked trees lost at harvest time through breakage or otherwise.

Determination of allowable cut.--The allowable cut is influenced by two somewhat conflicting aims: first to build stands up to full stocking, tentatively considered to be about 10,000 board feet per acre; and second, to sell enough timber to provide some income and pay taxes and other management expenses. Consequently, the allowable cut for each compartment is affected by the level of growing stock, the cutting cycle, and the prospective growth.

Table 1 shows the schedule of cuts adopted in 1937 and

Table 1.--Allowable cut, by cycle and stand volume

Growing stock, per acre (MBF)	Cutting cycle		
	3-year	6-year	9-year
	Board feet		
10	1,600	3,000	4,100
9	1,300	2,520	3,420
8	1,120	2,080	2,800
7	910	1,680	2,310
6	720	1,320	1,800
5	550	1,000	1,400
4	400	720	1,000
3	270	480	690
2	160	280	400

Table 2. --Compartment cutting order

Year (winter)	Cutting cycle					
	3-year			6-year		9-year
	- - - Compartment number - - -					
1937-38	...	2	21	12	13	33
1938-39	52	53	55	...	32	22
1939-40	34	25	15	...	24	23
1940-41	...	2	21	44	45	1
1941-42	52	53	55	...	31	35
1942-43	34	25	15	...	43	54
1943-44	...	2	21	12	13	14
1944-45	52	53	55	...	32	11
1945-46	34	25	15	...	24	...
1946-47	...	2	21	44	45	33
1947-48	52	53	55	...	31	22
1948-49	34	25	15	...	43	23
1949-50	...	2	21	12	13	1
1950-51	52	53	55	...	32	35
1951-52	34	25	15	...	24	54
1952-53	...	2	21	44	45	14

still in use. It assumes growth of 6 percent per annum, compounded; and it provides for leaving some of the growth (since none of the compartments are fully stocked) to build up the stocking.

The compartment cutting order of table 2 was designed to reduce the effect of weather cycles on study results. It provides about the same acreage and timber volume (adjusted for the gradual increase in growing stock) to be cut each year.

Marking practice. --In general, the single-tree selection system has been followed in marking. Trees have always been cut or left on their individual merits and the size of the cutting budget. The first one or two cyclic harvests were essentially sanitation cuts. That is, mature, poor-risk, defective, and very low grade trees constituted the bulk of the cut. Thereafter, more attention was paid to merchantable length, crown quality, grade potentialities, and spacing of the trees left for additional growth. The aim has always been to remove those with poorest possibilities along with those that have reached maturity.

The allowable cut is based only on trees of sawtimber size. Smaller pines are marked to thin or improve the stand, or to anticipate mortality. They are not budgeted, but are treated as a recruitment pool for high-quality sawtimber growing stock.

No hardwoods are budgeted. The policy has been to sell merchantable ones as rapidly as possible, and not to permit hardwoods of sawtimber size to develop. By 1942 it had become apparent that control of hardwoods more than 3.5 inches in d.b.h. would greatly stimulate pine growth and reproduction. Since then, unmerchantable hardwoods of these sizes have been girdled and poisoned on most compartments. Even on treated compartments, however, some small hardwoods still remain and will require control in the future.

Harvest and Growth

Products, 1938-52. --Over 4 million board feet of pine and hardwood sawlogs have been harvested since the study began (table 3). On the average, 3,518 board feet of pine and 746 board feet of hardwood sawlogs have been removed per acre during the 15-year period. In effect, an amount equal to 75 percent of the original pine volume was cut at the same time that the stands were being built up to higher stocking. The pine logs averaged 109 board feet, varying from 91 to 125 by compartment. Forty-two percent of the pine logs were grade 1, 28 percent were grade 2, and the remainder were grade 3. Nearly 5 cords of pine pulpwood per acre were taken from below-sawlog size pines and the tops of trees cut for sawlogs.

Table 3. --Annual volume of forest products harvested

Year	Pine logs	Hardwood logs	Pine pulpwood	Gum pulpwood	Hardwood chemical wood
	- - Board feet[1] -		Standard cords		Units[2]
1938	177,897	107,593	771	...	372
1939	123,342	91,473	572	...	493
1940	130,757	29,707	210	...	316
1941	151,361	15,707	209	2	298
1942	139,820	41,215	605	126	290
1943	143,740	93,738	176	43	316
1944	257,911	21,550	629	172	209
1945	146,349	111,172	279	239	662
1946	157,877	18,859	108	63	384
1947	251,965	67,535	105	76	82
1948	477,428	91,219	278	64	274
1949	423,969	10,072	178	...	...
1950	327,044	12,113	197	...	...
1951	342,857	1,658	154	...	...
1952	117,508	1,260	69	...	...
Total	3,369,825	714,871	4,540	785	3,696
Per acre	3,518	746	4.7	.8	3.9

1/ International rule, 1/4-inch kerf.
2/ 138 cubic feet.

These puny pines are not necessarily beyond redemption. ⇨

Growth. --The compartment cutting order (table 2) is such that some compartments received their first cut when the study began and others as much as eight years later. Since interest centers on the response to management, growth has been computed for each compartment for the period between the first cut and the last inventory prior to 1953. Therefore, tables 4 and 5 include neither the volume per acre prior to management nor the volume removed in the first cut. They show only the growth since management began. Pine growth alone is included. Board-foot values are for trees more than 11.5 inches, while cubic-foot calculations include all trees over 3.5 inches in diameter.

Table 4. --Board-foot [1/] volume growth per acre in relation to growing stock

Compartment number	Growing stock after first cut	Cut during growth period	Growing stock at end of growth period	Growth period	Average annual growth	
	- - - Board feet - - -			Years	Board feet	Percent
2,001 to 3,000 board feet						
52	2,391	1,928	6,522	12	505	21.1
43	2,493	...	3,780	6	214	8.6
21	2,564	3,046	6,861	15	490	19.1
53	2,589	1,130	4,831	12	281	10.8
11	2,699	...	4,990	9	255	9.4
33	2,924	...	5,404	9	276	9.4
	2,610				363	13.9
3,001 to 4,000 board feet						
15	3,035	1,453	5,871	12	357	11.8
31	3,491	...	5,930	6	406	11.6
55	3,566	1,837	6,289	12	380	10.7
13	3,677	1,488	7,318	12	427	11.6
45	3,685	1,528	6,896	12	395	10.7
	3,491				392	11.2
4,001 to 5,000 board feet						
44	4,382	1,522	6,842	12	332	7.6
1	4,464	...	9,483	9	558	12.5
25	4,473	2,304	6,843	12	390	8.7
23	4,513	...	7,950	9	382	8.5
35	4,555	...	8,829	9	475	10.4
34	4,699	2,346	7,626	12	439	9.4
14	4,718	...	7,796	9	342	7.2
	4,543				413	9.1
5,001 to 6,000 board feet						
54	5,058	...	9,336	9	475	9.4
32	5,061	1,930	8,506	12	448	8.9
2	5,141	4,007	7,804	15	445	8.7
22	5,166	...	8,606	9	382	7.4
24	5,199	2,095	8,729	12	469	9.0
12	5,725	2,256	9,376	12	492	8.6
	5,225				454	8.7

1/ International rule, 1/4-inch kerf.

Table 5. --Cubic-foot growth per acre in relation to growing stock

Compartment number	Growing stock after first cut	Cut during growth period	Growing stock at end of growth period	Growth period	Average annual growth	
	- - - Cubic feet - - -			Years	Cubic feet	Percent
601 to 800 cubic feet						
43	630	...	877	6	41	6.5
11	727	...	1,167	9	49	6.7
33	743	...	1,189	9	50	6.7
52	783	429	1,443	12	91	11.6
	721				62	8.6
801 to 1,000 cubic feet						
53	862	307	1,171	12	51	6.0
15	879	300	1,529	12	79	9.0
55	927	359	1,461	12	74	8.0
45	995	291	1,695	12	83	8.3
	916				72	7.9
1,001 to 1,200 cubic feet						
44	1,007	273	1,468	12	61	6.1
1	1,039	...	2,033	9	110	10.6
14	1,064	...	1,657	9	66	6.2
21	1,069	551	1,729	15	81	7.6
13	1,076	347	1,764	12	86	8.0
35	1,093	...	1,883	9	88	8.0
25	1,107	432	1,647	12	81	7.3
34	1,111	426	1,591	12	76	6.8
	1,071				80	7.5
1,201 to 1,400 cubic feet						
24	1,220	382	1,735	12	75	6.1
31	1,221	...	1,857	6	106	8.7
23	1,230	...	1,807	9	64	5.2
54	1,244	...	2,010	9	85	6.8
22	1,261	...	1,807	9	61	4.8
2	1,284	748	1,647	15	74	5.8
32	1,363	365	1,838	12	70	5.1
	1,260				75	6.0
12	1,463	442	1,958	12	78	5.3

The average annual growth of 75 cubic feet or 407 board feet per acre for the tract as a whole is quite gratifying. Comparisons with similar unmanaged stands in the area indicate that management has increased growth at least 100 board feet per acre per year. Still better growth is imminent because the spacing, general health, and vigor of the current growing stock has been improved and there has been a large increase in reproduction, saplings, and poles.

The growth per acre per year shows a considerable variation among compartments with about equal amounts of growing stock. Some of the unusually large or small growth rates are explainable in terms of stand characteristics. For instance, the large board-foot growth (in relation to growing stock) on compartment 52 was due chiefly to ingrowth from sub-sawlog trees. The very small growth on compartment 53 derives from the fact that most of the volume is concentrated on 10 of the 40 acres. Such variation in growth is certain to be temporary.

Growth percents will decrease as growing stock approaches the carrying capacity of the site. Growth percent is only one part of the growth story. Another is the curve of actual growth, particularly its peak. So far, the greatest growth has occurred on compartments with about 1,200 cubic feet of growing stock per acre (table 5). These values are almost certain to change. The tree distribution, the diameter dispersion, and the average quality and vigor of the stands still can be considerably improved, and such improvement will bring with it a higher peak in the growth curve. A maximum sustained growth of more than 100 cubic feet per acre annually is not at all unlikely.

Board-foot growth is still rising. If due allowance is made for continued improvements in stand structure, maximum sustained sawtimber growth seems capable of exceeding 600 board feet per acre annually. Current indications are that growth in board feet--and in dollars--will peak at considerably higher levels of stocking than have yet been attained on any compartment.

Changes in stand structure. --Stand-structure diagrams, showing the number of pines and cubic volume by diameter class, permit a bird's-eye view of the changes that have occurred.

As indicated in figure 3, the number of 4- to 9-inch trees has decreased since 1937. This has been brought about by the thinning of dense thickets, the removal of defective and misshapen stems, and the salvage of ice-damaged timber, as well as the growth of many trees into the sawtimber category. The reduction in pre-sawlog size stems

is not serious. Such trees are still numerous enough for recruitment purposes. Moreover, their ranks will soon be swelled by the reproduction that has developed because of hardwood control, harvesting, and fire protection.

The cubic volume per acre in pre-sawlog pines has decreased slightly (fig. 4). There has been a modest increase in the cubic volume of trees 9 to 14 inches d. b. h. and a large increase in the volume in trees 15 inches d.b.h. and larger. Needless to say, the larger trees and their growth are worth much more per cubic foot than smaller ones. In large trees, logging and milling costs are low and the yield of No. 1 common and better lumber is high.

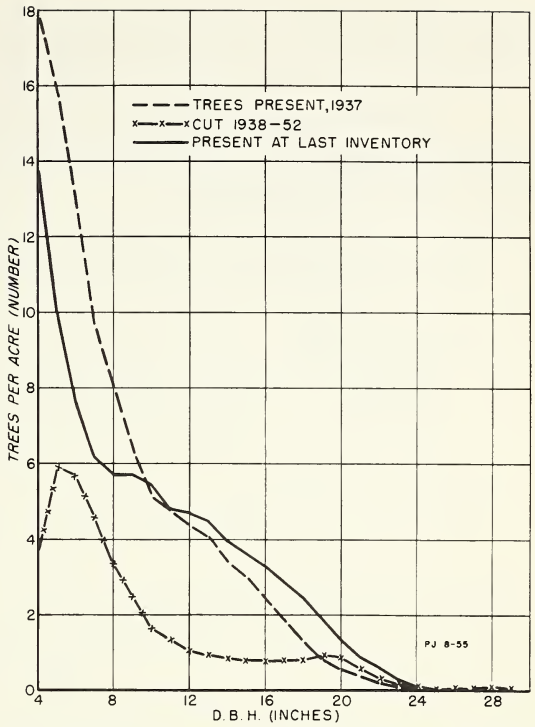

Figure 3.--Number of pines per acre, by tree size.

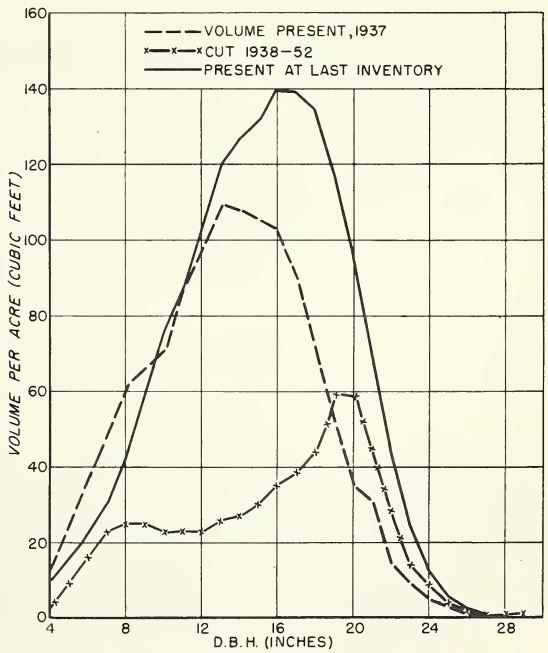

Figure 4.--Pine cubic volume per acre, by tree size.

Costs and Returns

Returns.--Stumpage returns over the 15 years are estimated at $77,912 or $81.33 per acre. At the same time, there was a net accretion of growing stock amounting to $22,197, or $23.17 per acre.

In estimating returns, stumpage prices prevailing in the Crossett area were adjusted to reflect differences in log grades. Though a widespread graded log market does not exist

at present, studies have shown that prices paid for stumpage tend to reflect differences in timber quality.

Markets for chemical wood do not exist outside the Crossett territory. For this reason, returns from this product are not included in the figures that follow.

The value of trees harvested during 1938-52 was:

Pine sawlogs				
Grade 1	1,430,175 bd.ft.	at $24.17/M	=	$34,567.00
Grade 2	934,379 bd.ft.	at 16.09/M	=	15,034.00
Grade 3	1,005,271 bd.ft.	at 9.79/M	=	9,842.00
Hardwood sawlogs	714,871 bd.ft.	at 13.84/M	=	9,894.00
Pine and gum pulpwood	5,326 std. cords	at 1.61/cd	=	8,575.00
		Harvest value		$77,912.00

To the harvest value must be added the net value of the increase in growing stock.

Increase in pine sawlogs:				
Grade 1	72,705 bd.ft.	at $24.17/M	=	$ 1,757.00
Grade 2	704,623 bd.ft.	at 16.09/M	=	11,337.00
Grade 3	2,166,637 bd.ft.	at 9.79/M	=	21,211.00
Decrease in hardwood sawlogs:	714,871 bd.ft.	at 13.84/M	=	-9,894.00
Decrease in pine pulpwood:	1,375 std. cords	at 1.61/cd	=	-2,214.00
		Net increase in value		$22,197.00

Costs.--Cost information collected in this study includes many items incurred especially for research. The following estimates, therefore, are based partly upon experience during the study and partly upon the records of landowners in south Arkansas and north Louisiana who were intensively managing their woodlands over the 1938-52 period.

The estimates assume that the study tract is being operated as a tree farm selling stumpage. Only such costs are given as would be incurred by a prudent timberland owner. It is presumed that a con-

sulting forester is hired to operate the tract and that the landowner pays for all necessary cultural work and capital improvements. The costs are summarized in terms of a thousand-acre unit:

	Annual cost per thousand acres
	Dollars
Taxes, 12 cents per acre	120
Fire protection (includes 2 cents cooperative state fee)	50
Road building and maintenance, 3.2 miles	216
Car use, 500 miles	35
Cruising and management planning 7.5 man-days every 10 years	25
Timber marking and sales, 10 man-days	150
Hardwood control, 625 man-days in 30 years	133
Supervision and miscellaneous supplies	94
	823

These costs, applied to the 958-acre tract for the 15 years of the study, amount to $11,827.00. The costs and returns are summarized in table 6.

Table 6.--Net returns, 1938-52 prices

Item	Total	Per acre	Per acre per year
	- - -	Dollars	- - -
Stumpage return	77,911	81.33	5.42
Growing stock accretion	22,197	23.17	1.54
Gross return	100,108	104.50	6.96
Cost of forest management	11,827	12.35	.82
Net return	88,281	92.15	6.14

Choice sawlog trees of the future. Most of these 8-to 10-inch pines have cleaned up for 3 logs.

Implications

Almost every land manager who undertakes to practice forestry runs head-on into the question: How much growth can I look forward to?

Estimates of growth are useful and can be made in a variety of ways. By contrast, actual growth data are relatively scarce. This study has yielded rather comprehensive tables of growth from 24 managed forties representing a wide range of stocking. About one-third of the forties had stocking quite comparable to that obtaining on medium and large holdings today. The other two-thirds portray the growth pattern that must be passed through on the way to full stocking.

Foresters will know how to put these tables to their best use. In passing, it may be worth noting that the striking growth under management suggests the advisability of shortening the developmental period of the stands as much as possible. The obvious ways of doing this are to hold cutting to the minimum consistent with the needs of the business and to control unwanted hardwoods immediately.

What returns can the owner of a few hundred to several thousand acres expect from intensive forest management? Results, of course, will vary with the size of the tract, differences in initial stocking,

management costs, and market prices for forest products. Over the fifteen years, timber sales from the 958-acre study tract have paid all management expenses and returned $4.60 per acre annually to the landowner. In addition, the stands have been markedly improved in structure. The value of the growing stock has increased by more than $1.50 per acre per year. The tract promises to yield even greater net returns in the next fifteen years.

The stakes of intensive management are low and the rewards are high.

APPENDIX

Crossett Log Grades for Pine

Grade 1. --Surface-clear logs 10.0 inches or larger in diameter inside bark at the small end, and logs over 16.0 inches in diameter at the small end containing not more than three 2- to 4-inch knots, or the equivalent (usually a maximum of about 6) in small knots. Length 10 feet or more. Logs otherwise of this grade but having 15 percent or more of volume lost because of sweep, crook, or other external defects are reduced one grade. A loss of over 40 percent would reduce the grade of the log to 3. A loss of over 50 percent of the volume culls the log. Grade 1 logs are expected to produce 25 percent or more of B and B lumber or 60 percent or more of B and B and No. 1 C combined.

Grade 2. --Surface-clear logs 8.0 to 9.9 inches d.i.b. at the small end, logs over 8.0 inches containing numerous small knots, or logs over 14.0 inches d.i.b. at the small end and containing numerous small knots or up to six 2- to 4-inch knots. Length 10 feet or more. Logs otherwise of this grade but having 20 percent or more of the volume lost because of sweep, crook, or other external defects are grade 3. A loss of 40 percent or more of the volume culls the log. Grade 2 logs are expected to produce 10 percent or more of B and B lumber or 50 percent or more of B and B and No. 1 C combined.

Grade 3. --Knotty or crooked merchantable logs 8.0 inches d.i.b. at the small end that do not qualify for grade 1 or 2. Length 10 feet or more. Logs otherwise of this grade but with 20 percent or more of the volume lost because of sweep, crook, or other external defect are cull. Grade 3 logs are not expected to produce more than 5 percent of B and B lumber or more than 40 percent B and B and No. 1 combined.

Conditions Applicable to All Grades

Small knots are any live or dead branch stubs of any size up to and including 1.9 inches in diameter. Large knots are 2.0 inches or more in diameter. Knots that are bunched at one end of a log, or on one face, do not affect lumber grade yield as much as an equal number scattered over two or more faces. Thus, unless crook or rot is also present, logs with bunched knots should not be reduced in grade as called for by the above definitions.

Logs showing unmistakable evidence of Fomes pini are automatically reduced one grade below that indicated by the knot or surface characteristics. This grade reduction would be in addition to any caused by sweep or other defect.

Table 7.--Average merchantable pine pulpwood volume in tops of sawlog trees

D. b. h. (inches)	Volume per tree top
	Cubic feet
12	7.0
13	7.2
14	7.2
15	7.2
16	7.2
17	7.2
18	7.6
19	8.2
20	8.8
21	8.6
22	8.1
23	7.4
24	6.4
25	5.3
26	4.0
27	2.5
28	.9

Table 8.--Cubic volume in trees

D. b. h. (inches)	Pine	Hardwood
	- - Cubic feet - -	
4	0.8	0.7
5	1.7	2.0
6	3.1	3.3
7	5.2	4.8
8	7.8	6.7
9	10.7	8.9
10	14.1	11.3
11	18.0	14.0
12	22.4	16.8
13	27.1	19.7
14	32.1	22.7
15	37.4	25.7
16	43.1	28.7
17	49.1	31.9
18	55.5	35.3
19	62.3	38.8
20	69.7	42.6
21	77.9	46.8
22	86.4	51.4
23	94.9	56.3
24	103.2	62.0
25	111.2	68.4
26	119.2	75.0
27	127.0	82.0
28	135.0	89.4
29	143.0	96.9
30	151.0	104.5
31	159.0	112.3
32	167.0	120.5

Table 9. --Estimated merchantable cubic volume per 16-foot log, by log position in the tree

D. b. h. (inches)	Pine				Hardwood		
	First log	Second log	Third log	Fourth log	First log	Second log	Third log
	- - - -Cubic feet- - - -				- - Cubic feet - -		
12	8.38	6.45	4.65	3.04	7.7	5.8	2.4
13	9.80	7.71	5.59	3.46	8.9	7.0	3.4
14	11.34	9.26	6.60	3.92	10.2	8.2	4.3
15	12.99	10.95	7.88	4.65	11.3	9.4	5.0
16	14.75	12.57	9.26	5.45	12.6	10.6	5.5
17	16.62	14.30	10.56	6.31	14.0	11.7	6.2
18	18.60	16.14	11.95	7.23	15.6	12.9	6.8
19	20.70	17.84	13.42	8.38	17.5	13.9	7.4
20	22.90	19.64	14.75	9.44	19.4	15.0	8.2
21	25.22	21.79	16.38	10.56	21.4	16.0	10.1
22	27.65	23.76	18.10	11.95	23.6	17.1	11.1
23	30.19	25.82	19.64	13.20	25.8	18.2	12.1
24	32.84	27.96	21.24	14.30	28.1	19.3	13.1
25	35.61	30.19	23.19	15.44	30.4	21.2	14.1
26	38.48	32.51	25.22	16.86	32.8	23.2	15.1
27	41.47	34.91	27.03	18.10	36.2	25.2	16.1
28	44.57	37.39	29.22	19.37	38.7	27.3	17.1
29	47.48	39.95	31.23	20.64	41.4	29.5	18.1
30	51.10	42.54	33.24	21.94	44.1	31.8	19.1
31	54.53	45.31	35.25	23.30	46.9	34.2	20.1
32	58.03	48.26	37.26	24.72	49.7	36.7	21.1
33					52.5	39.2	22.1
34					55.3	41.9	23.1
35					58.1	44.6	24.1
36					60.9	47.4	25.1
37					63.7	50.3	26.1
38					66.5	53.2	27.1
39					69.3	56.3	28.1


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